EXPERIMENTAL ANALYSIS OF HUMAN BEHAVIOR BULLETIN

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STUDENT PAPER COMPETITION

ARTICLES AND BRIEF REPORTS

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ANNOUNCEMENTS

THE EXPERIMENTAL ANALYSIS OF HUMAN BEHAVIOR BULLETIN

The *EAHB Bulletin* is published twice yearly, in the Spring and Fall, by the Experimental Analysis of Human Behavior Special Interest Group (EAHB SIG), a group organized under the auspices of the Association for Behavior Analysis (ABA). Articles in the *Bulletin* represent the views of the authors. They are not intended to represent the approved policies of the SIG or ABA, or the opinions of the membership of the SIG or ABA. The inside back cover has information about joining the SIG. Publication costs are paid by the dues of the SIG members and by the Parsons Research Center of the University of Kansas.

We thank Tom Callahan, Patti Gaiser, Fay Gilbert, Gloria Middleton, Kelly Spellman and Cynthia Willey for help with this issue.

Guidelines for Submissions

Please send three copies of brief reports and one copy of other materials. In addition, send one clearly labeled, reproduction quality copy of each figure or table. For general information on preparing materials for publication in the *Bulletin*, we encourage authors to consult the author guidelines in the January issue of the *Journal of the Experimental Analysis of Behavior*. If possible, send text and figures of final versions on disk.

Brief Reports and Technical Information should be no longer than 2,000 words. They can be written in APA style (without an abstract) or in summary form. Please prepare figures and tables to fit the column or page width of the *Bulletin*. Incorporate information typically included in figure captions in the text.

Research in Progress may be up to 1,000 words long.

Laboratory Descriptions (as in Spring, 1990 and Spring, 1991 issues) may be up to 2,000 words long (including publication list).

EAHB members have a standing invitation to submit Abstracts from posters and presentations given at conferences. Abstracts should be 200 words or less. Please include, on the same page as the abstract, the name and address of a contact person and a full citation for the presentation.

Please submit brief reports, technical information, and laboratory descriptions to Bill McIlvane (Behavioral Sciences Division, E. K. Shriver Center, 200 Trapelo Road, Waltham, MA 02254); submit research in progress, abstracts, and news to Kate Saunders (Parsons Research Center, P.O. Box 738, Parsons, KS 67357).

Submit brief reports and technical information by April 12 and all other materials by May 4 for the Spring, 1993 issue.

1993 OUTSTANDING GRADUATE STUDENT PAPER AWARDS

The EAHB-SIG congratulates the recipients of Outstanding Paper Awards in its 9th Annual Student Paper Competition. The competition solicited student submissions addressing any topic relevant to the experimental analysis of human behavior. Established members of the SIG and selected guest experts served as peer reviewers on the manuscripts. On the basis of reviewer recommendations, this year's winners, and the titles of their papers, include:

Nancy C. Brady, University of Kansas; In the beginning there was a mand: A review of research on teaching mands to individuals with severely limited verbal repertoires (Sponsors: Kathryn J. Saunders and Joseph E. Spradlin)

Kathleen M. Dougherty, Auburn University; Say-Do correspondence: A verbal operant analysis (Sponsor: James M. Johnston)

Jan Jackson, University of North Carolina at Wilmington; Thematic match-to-sample: Teaching children conditional discriminations without verbal instructions (Sponsor: Carol Pilgrim)

Michael Markham, University of New Mexico; Compound stimuli in emergent stimulus relations: Expanding the scope of stimulus equivalence (Sponsor: Michael J. Dougher)

The winners will be honored at an awards symposium at the 1993 ABA Convention in Chicago where they have been invited to present a summary of their work. Watch the Spring edition of the Bulletin for summaries of the winning papers. See page 44 for information about the 1993-94 competition (submission deadline: September 20, 1993).

The following reviewers of student papers are greatly appreciated:

Ruth A. Baer
Philip N. Chase
Richard DeGrandpre
Michael Dougher
Mona El-Sheikh
Edmund Fantino
Stephen Flora
Laura Fredrick
Patrick Ghezzi
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Bernard Guerin
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J. G. Osborne
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Carol Pilgrim
Richard R. Saunders
Sherry L. Serdikoff
Robert Stromer
Edelgard Wulfert
Robert D. Zettle

Editors' note: Tom Critchfield has done a stupendous job coordinating the Student Paper Competition. Thanks Tom!

TESTING FOR EMERGENT PERFORMANCES IN EXTINCTION

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Universidade Federal do Pará and New England Center for Autism

When a subject learns to do one task and then, because of that learning, proves capable of doing another task (or the same task under different circumstances), we speak of *transfer of training* from the first task to the second. A methodological question that arises in testing for transfer is whether or not to reinforce the "derived" performance during the test. What looks like positive transfer in a test with differential reinforcement could be attributable to reinforcement during the test, and what looks like negative transfer in a test without reinforcement could be attributed to extinction during the test. In both of these instances, the experimenter would be unaware that the first task was irrelevant to the subject's performance in the second. Sidman (1981), discussing the significance of positive and negative results in transfer tests, concluded that "Evidence of transfer even during extinction, or the failure of transfer even with reinforcement will provide unequivocal positive or negative answers, respectively, to the original experimental question" (p. 129).

In the context of research on equivalence relations in this laboratory, we had become accustomed to testing subjects' derived performances in extinction. Lulled into complacency by our many successes in demonstrating the emergence of new conditional discriminations without differential reinforcement during the tests, we fell into the trap of accepting negative transfer, too, as a valid finding. The purposes of this paper are to (a) remind other researchers that failures to observe transfer during tests without differential reinforcement may be a methodological artifact, (b) describe some ways to test for such an artifact, and (c) call attention to some previously reported negative results whose significance may be compromised because testing was carried out in extinction.

Two Case Histories

The following is a brief description of data from subjects whose failures on transfer tests turned into successes after (a) the introduction of a consequence for "completely correct tests" or (b) other changes in the instructions. These results serve to remind us that a subject's failure in tests without differential reinforcement should not be taken simply as negative results but as an indication that other variables than those being tested might be controlling the subject's behavior.

A consequence for correct tests

One experiment (reported in detail by Calcagno, Galvão, Dube, & Sidman, 1992), was designed to test for the emergence of a standard matching-to-sample performance after a subject had been taught constructed-response matching to sample (Dube, McDonald, McIlvane, & Mackay, 1991). Subject HRR, a teen-aged student at the New England Center for Autism, was given nonsense combinations of three letters as samples and a pool of letters from which to construct other three-letter nonsense combinations. He learned (with our standard beeps and points as reinforcers) to construct whatever letter combination the experimenters had arbitrarily designated as correct for each sample. In subsequent tests without beeps or points, we used standard matching-to-sample procedures. Letter combinations that had been samples during constructed-response matching were presented with comparisons composed of previously constructed three-letter combinations. The purpose of the tests was to determine whether the subject would select the letter combination he had previously learned to construct when given each sample.

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The matching-to-sample tests led to what looked like negative results. In 42 tests, the subject gave no evidence of being able to match the samples to the letter combinations he had learned to construct.

Because the subject usually maintained perfect constructed-response baseline performances even without reinforcement, we had discounted the likelihood that extinction was responsible for the failures in the standard matching-to-sample tests. Still, another subject whose general level of functioning was somewhat lower had succeeded in the matching-to-sample tests, so we were not convinced that Subject HRR was incapable of the tested performance. We therefore reexamined the possibility that the seemingly negative results reflected not a failure of transfer but the effects of extinction during the test itself.

We gave the subject the following instructions before subsequent tests: "This time there will be no beeps and no points [our standard reinforcers], but if you answer all trials correctly you will earn a hundred bonus points." Because the bonus was contingent on a correct performance in every trial, even though not contingent on individual responses, we called this a "one-shot" procedure. If it caused the formerly negative results to become positive, the experiment would be over; subsequent tests would reflect only the direct reinforcement of the tested performance by the extra bonus points.

In the first test administered after the introduction of the bonus for perfect tests, Subject HRR was correct on only 8 out of 15 trials and missed the bonus. In the second test, however, he was correct on all 15 trials and in four more tests he repeated the 100% correct performance. Clearly, the subject had been able to perform perfectly in the tests but the contingencies had been controlling some other performance. Missing the bonus in the first test was enough to make him show positive transfer from constructed-response to standard matching to sample.

New instructions

Subject PMD was a teenager diagnosed as autistic. He began to have problems during pretraining when we gave him previously learned matching-to-sample trials (the stimuli differed from those to be used during the experiment) without reinforcement. Subject PMD did not maintain his performance in extinction. This time, we wondered whether the problem was extinction *per se* or whether the absence of reinforcement simply removed our implied demand that he do well. Therefore, in addition to our usual pre-extinction instruction that there would be no beeps or points, the experimenter added "...but I would like you to do as well as you can this time, anyway." This new instruction worked; Subject PMD met the learning criterion even without differential reinforcement and was able to complete pretraining and go on with the experiment.

Subject HRR had also participated in a second set of experiments (reported in detail by Cohen-Almeida & Sidman, 1991 and by Galvão, Cohen-Almeida, & Sidman, 1992). In these experiments, functional classes were established by means of a repeated discrimination-shift procedure (Sidman, Wynne, Maguire, & Barnes, 1989; Vaughan, 1988) and tests were designed to determine whether two such classes that possessed a member in common would combine into a single larger class. We attempted first to establish three three-member functional classes (A1B1C1, A2B2C2, and A3B3C3). On every trial, three stimuli were displayed, one from each potential class (for example, A1, B2, and C3, or B1, B2, and A3). Positive stimuli were always members of the same potential class (for example, selecting A1, B1, and C1 would always be reinforced). Each time the subject attained a learning criterion with positive stimuli from one class, the positive stimuli changed (discrimination shift) to those from another class (for example, A3, B3, and C3). Eventually, the subject came to shift his selections to stimuli in the newly designated positive class immediately after the first trial of a discrimination shift, even though he had experienced the shifted contingency with only one member of the new class. At this point, we concluded that potential classes had become actual, with the stimuli in each designated class being functionally related.

We then established three two-member functional classes (A1D1, A2D2, and A3D3) in the same way. The A stimulus in each two-member class was also a member of a previously established three-member class. Would each D stimulus, related functionally to a particular A stimulus, join the class in which the related A stimulus was a member? To answer this question, unreinforced testing was carried out in which stimuli D1, D2, and D3 were displayed on some trials and either B1, B2, and B3, or C1, C2, and C3 on other trials. When the designated positive stimulus was B1 (or C1), would the subject also select D1; when the positive stimulus was shifted to B2 (or C2), or to B3 (or C3), would the subject shift his selections to D2 or D3, respectively? Would the subject's selections shift to D1, D2, and D3 appropriately as the designated B or C discrimination was shifted?

Once again, the tests proved negative. When the positive B or C stimulus was shifted, the subject did not shift his D selection in a way consistent with the assumption that the D stimuli had joined the classes to which their directly related A stimuli belonged. The D stimuli did not appear to have transferred their membership from the two- to the three-member classes. Nevertheless, the subject continued to shift the baseline discriminations appropriately, even without reinforcement.

We then added the instruction, "I would like you do as well as you can this time, anyway" before each test. Now, on retesting, Subject HRR's performance was nearly 100% correct. The repeated discrimination-shift procedure had clearly transferred the D stimuli from the two- to the three-member classes, but the absence of differential reinforcement had prevented positive test results. The extinction procedure had altered the demand characteristics of the test situation.

With continued testing under the same instructions, the subject's performance deteriorated again. We then tried the one-shot procedure that was described above, but this time it did not change Subject HRR's test results.

Discussion

The data reported here indicate that seemingly negative transfer could be reversed by changing only the reinforcement parameters during the test, without modifying the baseline that was to provide the basis for transfer. Adding the bonus points for correct overall test performances might have improved our subjects' transfer scores by changing any or all of three reinforcement parameters during the test: (a) an increased amount of reinforcement for correct responding; (b) more accurate feedback to the subject about the performance that is correlated with reinforcement; and (c) more accurate specification of the experimenter's expectations or demands. The performance improvement after subjects were merely told that the experimenter wanted them to do as well as possible suggests that alternative (c) may sometimes be sufficient. Subjects being tested in extinction may sometimes be telling us, "You are not giving me anything for doing these tests right. That means you do not care how I do, so I am just not bothering."

Changes from negative to positive transfer after we had changed only the reinforcement conditions in the tests emphasize the potentially deceptive nature of failures to observe transfer during tests without differential reinforcement. A case in point comes from a study by Sidman et al. (1989), who concluded that "A set of stimuli partitioned into subsets of functionally equivalent members does not represent the same behavioral process as conditional-discrimination tests for equivalence relations..." (p. 273). This conclusion was drawn from performance of one subject who seemed to have "...formed functional classes without being able to demonstrate equivalence relations between class members" (p. 273). Because this subject continued to show functional classes during discrimination reversals even in extinction but failed on tests for equivalence relations, extinction during the equivalence tests was not viewed as a relevant variable. The functional class tests, however, had a history of reinforcement, so the subject had been informed of the experimenter's expectations in those tests. The tests for equivalence relations, however, had no reinforcement history. Therefore, the negative results in the Sidman et al. (1989) study might still have been an artifact of extinction during the equivalence tests.

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SOME EFFECTS OF PRESENTING NOVEL STIMULI ON A CHILD'S SEQUENCE PRODUCTION

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Sequence-production procedures often involve displays of two or more physically dissimilar visual stimuli and contingencies of reinforcement that require a specified sequence of responses to these stimuli, regardless of their spatial locations (e.g., D'Amato & Colombo, 1988, 1989; Lazar, 1977; Lazar & Kotlarchyk, 1986; Sigurdardottir, Green, & Saunders, 1990; Straub & Terrace, 1981; Swartz, Chen, & Terrace, 1991; Terrace, 1986; Wulfert & Hayes, 1988). For example, selecting the simultaneously displayed stimuli A1 and A2 in the two-term sequence A1->A2 is reinforced, but selecting A2->A1 is not.

The child in the present study participated in a recent examination of conditional control of five-term sequence production (Stromer & Mackay, 1992). He first was taught to select in sequence each of one set of five stimuli (Sequence A). Another set of five stimuli was then used to train Sequence B. Next, direct training established conditional control of the production of Sequence A and its reversal: In the presence of one printed word, selecting the stimuli in the order A1->A2->A3->A4->A5 was reinforced; in the presence of another word, selecting the stimuli in the order A5->A4->A3->A2->A1 was reinforced. During probe sessions, the printed words exercised conditional control over the production of Sequence B and its reversal, suggesting the formation of sequence classes. The child also performed mixed sequences under conditional control of the words (e.g., A1->B2->A3->B4->A5 and its reversal), verifying that the stimuli which occupied the same position in each sequence were members of the same class (cf. Lazar, 1977; Stromer & Mackay, 1990, in press; Stromer, Mackay, Cohen, & Stoddard, in press).

The purpose of this investigation was to assess this same child's sequence production when novel stimuli were substituted for ones involved in original training. In probe type A1->X->A3->A4->A5, for example, we assessed whether the child would select the novel X stimulus in the serial position occupied previously by the training stimulus A2. Such an outcome might be expected on the basis of a kind of exclusion like that reported for humans' non-sequential discrimination learning (e.g., Dixon, 1977; McIlvane, Munson, & Stoddard, 1988; Stromer, 1986, 1989). Mackay, Stoddard, and Spencer (1989) used procedures based on this notion to establish new sequences in humans; D'Amato and Colombo (1989) used similar methods to study sequence learning in monkeys.

Method

Subject

A normally capable boy (AS), aged 10 years, had prior experience with five-term sequences (Stromer & Mackay, 1992, in press). At age 7, he also participated in a study that used three-term sequences (e.g., Mackay et al., 1989).

Apparatus

A Macintosh computer presented stimuli and recorded data. The video display contained a 10-key choice pool, a sequence-production area, and an area for presenting printed words (see below). Selections of stimuli in the choice pool involved moving the cursor to a key and pressing the button on the mouse.

Procedure and Results

Two sessions were conducted during each of two to four weekly meetings. Figure 1 shows the five-term A and B sequences and illustrative correct trials (selection of the stimuli in the order indicated by the arrows). Trials began with stimuli positioned in 5 of the 10 choice-pool keys; correct selections then moved them one at a time from the choice pool to the sequence-production area.

On trials when reinforcing consequences were scheduled, a correct sequence produced a jingle, a flashing display, and the intertrial interval. An incor-

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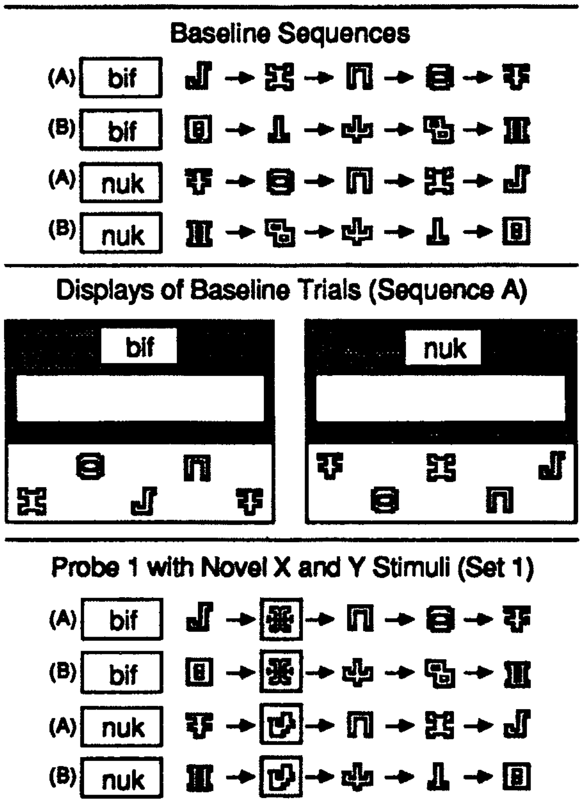

Figure 1. The five-term baseline sequences at the top show the order in which the A and the B stimuli were to be touched, conditional upon the printed word stimuli *bif* and *nuk*. The panels in the middle show representative computer displays of the baseline trials. At the bottom are probe sequences (Probe 1) in which novel X and Y stimuli were substituted for second and fourth stimuli from the baseline sequences.

rect selection (any touch not consistent with the defined sequence) produced a dark screen, then the intertrial interval. On unreinforced trials, both correct and incorrect sequences produced only the intertrial interval. Subject AS also earned $0.01 per correct trial.

Baseline. The baseline for this investigation involved conditional production of the five-term A and B sequences (Figure 1, top). When the printed word *bif* was displayed, touching the stimuli in the order A1->A2->A3->A4->A5 was reinforced; when the printed word *nuk* was displayed, touching the same stimuli in the reverse order was reinforced, A5->A4->A3->A2->A1. Similar contingencies applied with the B stimuli.

Details of training may be found elsewhere (Stromer & Mackay, 1992, in press). Immediately prior to this experiment AS received eleven 48-trial sessions involving a mixture of the A and B sequences (24 trials of each). During the last four of these sessions the consequences for correct and incorrect trials occurred on 25% of the trials. In addition, trials during the latter sessions were never interrupted; each trial ended after all five stimuli were selected whether correctly or not. AS's accuracy scores for baseline averaged 97%.

Probe sessions. Responses on probe trials were never reinforced but reinforcement was available on 25% of the baseline trials. All probe sessions involved a mixture of 48 baseline trials and eight probe trials (two each of four trial types). AS was paid $0.56 for each probe session regardless of his performance. Baseline accuracy never fell below 92% during the series of nine probe conditions involving three sets of probe stimuli (see Table 1).

Data in Table 1 reflect AS's performances across all probe conditions. A correct trial was defined as selections of stimuli in the order denoted alphanumerically.

Probe 1: Single-substitutions of novel stimuli. Probe 1 involved six sessions in which a novel X or Y stimulus from Set 1 (Figure 1, bottom) replaced different baseline stimuli in the presence of *bif* and *nuk*. The X stimulus replaced A2 and B2 in the presence of *bif*; the Y stimulus replaced A4 and B4 in the presence of *nuk*. The sequences thus examined were A1->X->A3->A4->A5 and B1->X->B3->B4->B5 in the presence of *bif*, and A5->Y->A3->A2->A1 and B5->Y->B3->B2->B1 in the presence of *nuk*. During Probe 1, AS nearly always selected the X and Y stimuli in the serial positions previously occupied by their respective training stimuli.

Probe 2a: Multiple-substitutions of stimuli. Probe 2a occurred once with Set-1 novel stimuli to assess whether the preceding experience with the X and Y stimuli might engender new sequential relations among the stimuli. Trials were the same as Probe 1, except the X and Y stimuli appeared simultaneously in each five-stimulus display. In the context of a five-term sequence, then, would the X and Y stimuli function just like the stimuli they replaced in each display? If so, the sequences A1->X->A3->Y->A5 and B1->X->B3->Y->B5 might occur in the presence of *bif;* and the reversal of these sequences, A5->Y->A3->X->A1 and B5->Y->B3->X->B1, might occur in the presence of *nuk*. Table 1 shows, on all but for two trials, AS produced the sequences appropriate to the printed words presented.

Probe 2b: Multiple-substitutions of novel stimuli. Probe 2b occurred three times, once with Set-2 novel stimuli and twice with Set 3. Probe 2b was identical to 2a, except the stimuli had not appeared previously.

Table 1
Order of Probe Conditions and Performances Consistent with the Order Depicted for each Trial Type (in parentheses)

1. *Probe 1 (Set 1)*		
bif:	A1->X->A3->A4->A5	(10/12)
	B1->X->B3->B4->B5	(11/12)
nuk:	A5->Y->A3->A2->A1	(12/12)
	B5->Y->B3->B2->B1	(12/12)
2. *Probe 2a (Set 1)*		
bif:	A1->X->A3->Y->A5	(11/12)
	B1->X->B3->Y->B5	(12/12)
nuk:	A5->Y->A3->X->A1	(11/12)
	B5->Y->B3->X->B1	(12/12)
3. *Probe 2b (Set 2)*		
bif:	A1->X->A3->Y->A5	(6/6)
	B1->X->B3->Y->B5	(6/6)
nuk:	A5->Y->A3->X->A1	(6/6)
	B5->Y->B3->X->B1	(5/6)
4. *Probe 3 (Set 2)*		
bif:	X->A3->Y	(0/6)
	X->B3->Y	(0/6)
nuk:	Y->A3->X	(1/6)
	Y->B3->X	(1/6)
5. *Probe 2b (Set 3)*		
bif:	A1->X->A3->Y->A5	(6/6)
	B1->X->B3->Y->B5	(6/6)
nuk:	A5->Y->A3->X->A1	(5/6)
	B5->Y->B3->X->B1	(6/6)
6. *Probe 3 (Set 3)*		
bif:	X->A3->Y	(1/6)
	X->B3->Y	(6/6)
nuk:	Y->A3->X	(2/6)
	Y->B3->X	(3/6)
7. *Probe 4*		
bif:	A2->A3->A4	(6/6)
	B2->B3->B4	(6/6)
nuk:	A4->A3->A2	(6/6)
	B4->B3->B2	(6/6)
8. *Probe 2b (Set 3)*		
bif:	A1->X->A3->Y->A5	(2/2)
	B1->X->B3->Y->B5	(2/2)
nuk:	A5->Y->A3->X->A1	(2/2)
	B5->Y->B3->X->B1	(2/2)
9. *Probe 3 (Set 3)*		
bif:	X->A3->Y	(0/2)
	X->B3->Y	(2/2)
nuk:	Y->A3->X	(0/2)
	Y->B3->X	(2/2)

Thus, this probe assessed performance generality. Would AS select one novel stimulus second and the other fourth?. Table 1 shows AS did just that; a particular one of the two novel stimuli in each set was consistently selected second and the other fourth. (These stimuli were thus designated "X" and "Y", respectively, post hoc.)

Probe 3: Three-term sequences with novel stimuli. Probe 3 always followed 2b and involved the stimuli from Sets 2 and 3. The purpose here was to assess another form of generality. Would exposure to Probe 2b establish sequential relations between the X and Y stimuli that were demonstrable in three-term rather than five-term sequence production (e.g., if *bif*, then X->A3->Y; if *nuk*, then Y->A3->X)? Table 1 shows that AS did not produce these three-term sequences with either the Set-2 or the Set-3 stimuli (presented twice). During these probes, AS always touched the training stimuli A3 or B3 second; the X and Y stimuli, however, were equally likely to be touched first or third.

Probe 4: Three-term sequences with baseline stimuli. Probe 4 provided control observations with respect to Probe 3 by assessing the production of three-term sequences using the familiar second, third, and fourth stimuli. AS's accuracy scores were perfect.

Discussion

During Probe 1 the child reliably substituted a novel X or Y stimulus for the respective individual training stimulus that each replaced. These results may be analogous to the exclusion phenomenon observed in matching to sample (Dixon, 1977; McIlvane & Stoddard, 1981, 1985; McIlvane et al., 1988; Stromer, 1986, 1989). To illustrate, consider the probe trial A1->X->A3->A4->A5: When the stimuli first appear, the child might select A1 first, based on his training history. Doing so leaves A3, A4, and A5 with X in the display. At this point, A3, A4, and A5 may function as S- stimuli, because only the selection of A2 had produced reinforcement during training and that stimulus is not available. Under these conditions, the subject may exclude A3, A4, and A5 and select X (cf. Mackay et al., 1989). The outcome of Probe 2a then extended the Probe-1 results in ways consistent with the subject's history. Each of the two novel stimuli were selected in the second and fourth serial positions of probe trials under conditional control of the printed words, even when both stimuli appeared together in the five-stimulus display.

During Probe 2b, the child selected the novel stimuli of Sets 2 and 3 in the second and fourth positions when they first appeared with trained first, third, and fifth stimuli. An exclusion account may, in part, describe these data. We also note, however, that the child's stimulus substitutions were invariant: he always selected one novel stimulus second and the other fourth, although nothing required such consistency. The tendency to "assign" stimuli to particular positions in the sequence is reminiscent of previous reports of subjects who select comparison stimuli conditionally in matching to sample without direct training for doing so (e.g., Saunders, Saunders, Kirby, & Spradlin, 1988; Stromer, 1986, 1989).

In matching to sample, one possible outcome is that the stimulus relations established under exclusion conditions may persist when the basis for exclusion is removed (e.g., McIlvane et al., 1988; Stromer, 1986, 1989). The results of Probes 2a and 2b suggest this kind of outcome. In Probe 3, however, when the display involved only an X, a trained third (e.g., A3), and a Y, the novel stimuli were not selected in the same order (e.g., X->A3->Y in the presence of *bif*) that occurred on the five-stimulus probe trials. If exclusion had established serial relations among the relevant stimuli, we would have expected performance like that during Probe 4 with the second, third, and fourth stimuli from the baseline sequences. It thus remains unclear if new serial relations were established by exclusion; if so, however, they were not reflected in performances during Probe 3.

The variables responsible for the kinds of performances shown by this child are under investigation. Training studies suggest that the exclusion phenomenon may occur in the sequence production of individuals with mental retardation (e.g., Mackay et al., 1989). A significant outcome is that such training has established new sequences errorlessly, much as reported for exclusion-based training in matching to sample (McIlvane, Bass, O'Brien, Gernovac, & Stoddard, 1984; McIlvane & Stoddard, 1981, 1985). Ongoing research is also assessing whether or not exclusion and arbitrary assignment in sequence production may reflect a subject's ability to learn ordinal relations among stimuli, as suggested, perhaps, by the present child's data (cf. D'Amato, 1991; D'Amato & Colombo, 1989; Green, Stromer, & Mackay, 1992; Stromer & Mackay, 1990, 1992).

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IT'S WHAT'S UP FRONT THAT COUNTS: SOME THOUGHTS ON THE INFORMATION GIVEN

SORACI, S. A., CARLIN, M. T., SHARP, D. L., FRANKS, J. J., VYE, N., and BRANSFORD, J. D.

Vanderbilt University

The present article represents an attempt to clarify some issues related to the relationship between perceptual and cognitive processes. It is based in large part on the present investigators' experience in conducting research that has focused on the facilitation of performances typically considered cognitive in nature. Several abilities that we have examined, including rule acquisition and application, transfer and generalization, and comprehension processes in the decoding of text, are importantly constrained by the effective detection of the informational structure embedded in a given visual or auditory environment.

Cognitivism and Behaviorism

At the risk of oversimplification, it is perhaps helpful to point out some general historical trends that have characterized research on learning processes in both the cognitive and behavior-analytic fields. Cognitive psychologists have typically been concerned with delineating the nature of internal representations and positing mediational mechanisms, such as those involved in concept and rule acquisition (e.g., Siegler, 1991), that are requisite for effective, higher-order processing. These approaches, which have focused on mediational processes, have tended to underemphasize the importance of perceptual or "front-end" variables (cf. Brown, Collins, & Duguid, 1989). Yet cognitive processes are importantly constrained by the individual's initial detection of particular stimulus properties and relationships (Bransford, Sherwood, Vye, & Rieser, 1986; Detterman, 1986; Gibson, 1979). The nature, however, of the precise relationship between perceptual and cognitive processes is a difficult and unresolved issue (Pinker, 1985).

Behavior-analytic researchers, on the other hand, have concentrated their efforts on a stimulus control approach (cf. Mackay & Sidman, 1984). The acquisition of stimulus relations, both identity-based and those considered "arbitrary" (i.e., no physical commonality between the to-be-learned stimuli), has been examined in very precise ways (e.g., Sidman & Tailby, 1982). Yet such relations are importantly constrained by structural aspects of the stimulus array (Soraci & Carlin, 1992). The complexity of visual structure present in the stimulus array, especially that involving interstimulus relationships (e.g., salience, disparity, geometrical properties, etc.), has been in large part ignored. Such interstimulus parameters, however, are importantly involved in observing behavior, which is inarguably a critical parameter in establishing stimulus control (Dinsmoor, 1985) and facilitating the detection of relevant interstimulus relationships (Soraci, Carlin, Deckner, & Baumeister, 1990). As Dinsmoor (1985) points out, traditional response-based analyses that omit observing behavior from their formulation cannot account for well established phenomena such as the rapid acquisition of a particular discrimination as a result of progressive training procedures.

The "Education" of Attention: Facilitating the Detection of Stimulus Relations

There have been a variety of approaches toward defining "attention", both within the field of cognition, and in several behavior-analytic positions. Cognitive theorists have discussed attention as "processes or conditions *within* (italics ours) the organism that determine how effective a particular stimulus

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Editor's Note: We promised articles presenting other approaches to topics studied in EAHB (Fall, 1991). This was invited from Sal Soraci and colleagues of the Learning and Technology Center and the Department of Psychology and Human Development at Vanderbilt University. Dr. Soraci serves on NIH Advisory Committees.

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will be" (Berlyne, 1974, p. 124), and, to note another example, as a limited capacity of the organism that can be allocated in various ways (cf. Reed, 1982). Behaviorists have considered attention to be a conditioned reinforcer (Ferster & Culbertson, 1982), the establishment of a specific stimulus-response relationship (Etzel, LeBlanc, Schilmoeller, & Stella, 1981), or processes "occurring further along in the sequence of events (i.e., after observing), presumably in the neural tissue" (Dinsmoor, 1985, p. 365).

Despite the range of perspectives on attention, one common aspect concerns the inference that attention, in some form, must have occurred in the organism if there is experimental evidence for a particular form of learning and/or differential selection of stimuli. Such operational approaches, however, leave open the question of the nature and definition of the stimulus per se. As Gibson (1979) has elegantly noted with respect to the study of visual perception, a critical and primary question is the following: How do we specify the structure of a stimulus? Gibson is forcing us to address the complexity of stimulus organization. Is a relation a single stimulus? Under what conditions is a pattern to be considered a unitary stimulus? Garner (1970) also called for a systematic analysis of the nature of the stimulus prior to drawing conclusions about the processing abilities of an individual. The emphasis here is on a delineation of the structure of the visual array, with reference to an organism's capability of detecting aspects of that structure. It is no less than a call for a theory of the stimulus; a theory of what there is to attend to.

Rescorla (1988) has discussed acquisition processes as involving the "learning of relations so as to allow an organism to represent its environment" (p. 151). This view is quite consistent with the perspective on "distributed intelligence" (Pea & Kurland, 1984) that emphasizes the importance of examining the interaction of the individual's knowledge base with environmental structure.

Our approach has entailed an examination of manipulations of stimulus structure at the perceptual or "front-end" in an attempt to "educate" attention (cf. Gibson & Gibson, 1955) and induce the acquisition of particular cognitive skills such as categorization or rule application. One example would be the study of the performance of young children on the oddity task. In this task, the subject is required to choose an "odd" or different, stimulus from a group of at least three stimuli, two of which are identical. Successful performance demands that the subject attend to multiple stimuli, the relations among stimuli, and the relevant dimension tested (e.g., color, form, size, etc.). Because of these factors, oddity learning has been said to involve attentional (Scott & House, 1978), conceptual (Gollin & Schadler, 1972), and perceptual (Soraci, Deckner, Baumeister, & Carlin, 1990) factors.

Children with mental ages of less than 5 years, both mentally retarded and nonretarded, are typically unable to succeed at a variety of oddity learning and transfer tasks (Greenfield, 1985; Soraci et al., 1990). We initially hypothesized that such failures, as opposed to being based on an inability of such children to apply sophisticated cognitive operations (cf. House, Brown, & Scott, 1974), were perhaps due to inadequate structuring of the visual array formats (Soraci et al., 1987). Specifically, several previous studies had utilized horizontal, extended arrays (e.g., Gollin & Schadler, 1972), that essentially demand that the subject scan stimuli individually. This procedure necessarily involves memory demands. Scanning of individual stimuli minimizes interstimulus contrast, and hence the detection of relational information. We based our hypothesis on the assumption that young children were less sensitive than older children to such relational stimulus parameters.

In several studies we have conducted, we have utilized a computer format in which all stimuli, both odd and nonodd, can be viewed essentially simultaneously. In addition, we increased the number of identical nonodd stimuli, in an attempt to enhance the perceptual salience, and concomitantly the detection, of the target stimulus (see Figure 1). In these arrays, the odd stimulus or target can be considered as "popping out" (cf. Treisman, 1988), with detection being relatively immediate. Not only has effective oddity-based responding been rapidly induced with this procedure, but effective transfer (i.e., accurate performance of the baseline task), reversal trial performance, and long-term maintenance typically occurs (cf. Soraci & Carlin, 1992, for a review).

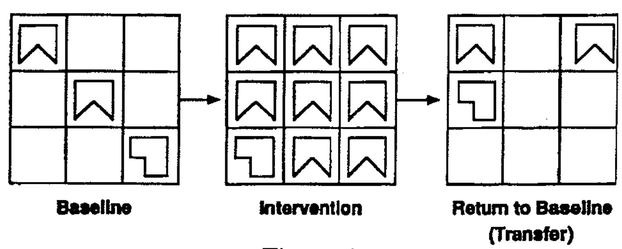

Figure 1

It should be noted that as the number of stimuli in a visual array increases, so does the interstimulus contiguity. In an experimental design exploring the relationship between spatial contiguity and number of elements (Figure 2 shows the four types of arrays), we have recently found that contiguity has a more powerful influence in facilitating oddity performance than number of elements (Bryant, Soraci, & Carlin, 1993). This is another example of the importance of the role of stimulus organization parameters on stimulus detection.

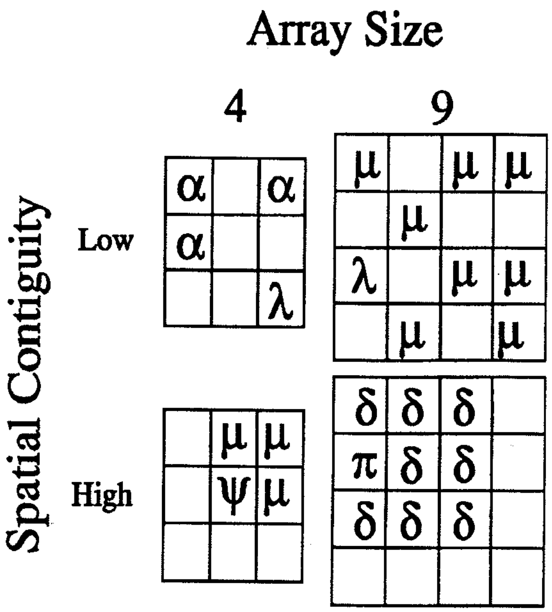

Figure 2

We have also extended our stimulus organization paradigm to examine the processes involved in the detection of auditory relational information. Young children's visual oddity performances were facilitated via the presentation of auditory stimuli that instantiated "oddity" in two modalities concurrently (Soraci et al., 1991). Put simply, the stimuli both "looked" and "sounded" different to the subjects.

These studies have in common the induction of a rule-based skill (i.e., oddity), via alterations in the interstimulus organization of particular visual arrays. Such findings indicate that discriminations, heretofore hypothesized to require relatively advanced conceptual and/or symbolic skills, can be achieved with structural manipulations designed to enhance detection of relevant stimulus relationships. The findings also have theoretical import, in that they suggest that individuals differing in intellectual functioning can be characterized as having a differential sensitivity to relational information (Soraci, Baumeister, & Carlin, in press).

Perhaps Skinner's (1957) notion of first instance learning, that is, the emission of a "correct" response in the absence of a conditioning history, can be reconceptualized in the context of the present studies. To the extent that manipulations of visual structure are effective in facilitating the detection (and hence observing; see Dinsmoor, 1985) of solution-relevant interstimulus relations, the "first instances" of such learning are dependent upon the attention-inducing aspects of such manipulations. From our perspective, the enhancing of perceptual relations is an important aspect of inducing sophisticated rule-based skills such as oddity, match-to-sample, and exclusion. Like contemporary connectionist models that address complex learning problems via a nonmediational network (McClelland & Rumelhart, 1986), we assume that "higher-order" associative learning is dependent upon, and in some sense derivative of, basic interstimulus relations and properties they instantiate. Our findings indicate that manipulations of visual arrays that render more salient the critical dimensions of difference do not necessitate mediational or symbolically-based rule induction. By manipulations of stimulus relations we have induced effective, generalizable rule utilization in children, both mentally retarded and nonretarded, who typically are unsuccessful on a variety of conceptually based tasks, such as oddity.

Integrated-Media: Facilitating Text Comprehension

We have also applied this general way of thinking to more complex situations. For example, we are currently involved in a project with kindergarten children who are at risk for school failure. The approach we are developing involves the use of dynamic visual information to provide support for language comprehension and language acquisition. A number of theorists argue that expertise in many areas is based on perceptual learning that produces efficient pattern recognition (e. g., Bransford, Franks, Vye, Sherwood, 1989; Garner, 1974; Gibson & Gibson, 1955; Simon, 1980). By structuring information dynamically, we are able to help children comprehend ideas and concepts that otherwise would be difficult for them to grasp.

Our experimental approach in this area has consisted of the utilization of dynamic visual accompaniment to text passages, via videodisc technology that provides support for facilitating story comprehension (Sharp et al., 1992). Such visual support can directly convey, for example, background knowledge and spatial relationships concerning characters and story events. This visual support for text is intended to enhance the particular mental models that children construct during story comprehension, since mental models bear a certain verisimilitude to properties instantiated in pictorial representations (McNamara, Miller, & Bransford, 1991). Dynamic visual support can thus be seen as modelling the translation from sentence to image, thereby enhancing children's translation of story information into mental models (Sharp et al., 1992).

Data from our project have indicated that children who were presented with helpful video during exposure to the initial part of a story exhibited better memory performance than children provided with non-helpful or no video when asked to remember information from the initial part of a story and from later parts of the story. For the later parts of the story, children in all three conditions saw no video and were instructed to listen to the story sentences and to "imagine" what the story scenes looked like. Hence the advantage for the helpful video conditions suggests that initial exposure to video can provide a framework for later language comprehension. We should note here that video support is particularly relevant for accommodating individual differences in the classroom. It allows less-skilled readers to join in class discussions with more advanced readers, since they share a similar story "context" (Bransford, Kinzer, Risko, Rowe, & Vye, 1989).

Conclusion

Herb Simon (1981) has noted that a critical characteristic of an intelligent system is the ability to extract "from the problem environment new information about regularities in its structure." In the present article, we have focused on the importance of visual structure in the induction of rule-based skills such as oddity, and in the facilitation of mental model building in children's comprehension of text. We believe that the effective design and utilization of visual formats conducive to the detection of relevant stimulus relationships holds great promise for the future of teaching thinking and learning skills.

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CONFERENCE PRESENTATION ABSTRACTS

Self-Control in Adult Humans: Effects of Time of Reinforcement Delivery

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Self-control has been defined as the choice of a larger, more delayed reinforcer over a smaller, less delayed reinforcer. Experiments with humans have suggested that the type of reinforcer used, specifically food and points exchangeable for money, influences the degree of self-control demonstrated by the subjects. In these experiments the reinforcers varied in terms of their type and in terms of when the subject actually received the reinforcer. The present experiment used a new self-control procedure to test the hypothesis that the differences found in self-control between different reinforcers may be due to differences in the time of delivery of the reinforcers. Subjects showed greater self-control for two types of reinforcers received at the end of a session compared to a type of reinforcer delivered during a session. These results suggest that the differences previously found in self-control for food and points exchangeable for money were due, at least in part, to differences in the time of delivery of the reinforcers, with subjects demonstrating less self-control for the food delivered during a session and more self-control for the points exchangeable for money delivered at the end of a session.

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Emergence of Matching to Sample after Constructed Response Training

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Universidade Federal do Pará, New England Center for Autism, E. K. Shriver Center

Mackay and Sidman (1984) reported emergent conditional discriminations (e.g., matching printed to dictated color names or to color patches) after subjects had learned "anagram naming" (construction of printed names from a pool of letters, given dictated color names or color patches). It is not clear how anagram naming brought about the conditional discriminations. We investigated two possibilities: First, seeing the whole word after constructing it may be necessary for emergent relations between samples and constructed words. We investigated this possibility by preventing visual feedback during construction—the subject selected the appropriate stimuli from the pool, but could not see the product. Second, in the emergent matching, the subject may simply have reached for the first letter as if to begin construction. We investigated this possibility by using combinations of three arbitrary forms instead of words; the same three forms were used in each constructed response and (later) in each comparison on emergent matching tests (e.g., ABC, BCA, CAB, etc.). A Macintosh computer with a touchscreen programmed stimulus presentations, procedural sequences, and recording. Results with a 21-year-old man with mental retardation indicated that visual feedback from the constructed response was not necessary to produce the emergent matching-to-sample performance; construction without visual feedback was sufficient. Also, matching emerged even when each comparison was made up of the same components, indicating that the subject did not respond correctly simply by selecting one element of a comparison.

Mackay, H. A., & Sidman, M. (1984). Teaching new behavior via equivalence relations. In P. H. Brooks, R. Sperber, & C. MacCauley (Eds.), *Learning and cognition in the mentally retarded* (pp. 493-513). Hillsdale, NJ: Erlbaum.

Poster: Association for Behavior Analysis, May, 1992.

Prospects for a "Psychophysics of Self-Observation"

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Given the popularity of self-reports as instrumentation on Psychology, it is surprising that relatively little research has focused on self-reports as behavior under environmental control. It is even less common for the presumed referent to be independently measured and the reporting and referent responses to be structured in a way that facilitates the quantification of their degree of correspondence. In framing new research questions regarding self-reports it may be productive to consider that studies of the sort needed bear structural similarity to psychophysical studies in which subjects make reports about external stimuli rather than reports about personal actions or characteristics. Psychophysical procedures allow for precise quantification of the correspondence between report and referent (e.g., via sensitivity and bias indices derived from signal detection analysis), and the results of studies based on them suggest independent variables likely to influence the reporting behavior of individual organisms. By suggesting methods, analytical strategies, and independent variables, psychophysical research may provide a model for preliminary studies of the behavior of self-reporting. Nevertheless, possible dissimilarities between self-reports and reports of external stimuli should not be ignored. At least two areas of divergence can be anticipated. First, the behavior-environment relations harnessed in the measurement of humans' self-reports are likely to overlap with existing response classes, meaning that predispositions not typically encountered in basic psychophysical studies may be expected. Second, the referent for many self-reports is a response made by the observer. The response, while superficially a unitary phenomenon from the experimenter's perspective, may have multiple stimulus features from the perspective of the observer. Given this ambiguity regarding the critical features of the referent event (and thus about the sensory system through which its energy is transduced by a self-observer), it may be difficult to parametrically manipulate physical characteristics of the stimulus as is common in psychophysical studies. These limitations notwithstanding, research informed by psychophysics may be expected to advance our understanding of the behavior of self-reporting regardless of whether that behavior is found to exhibit true functional similarity to the behavior of reporting about external stimuli.

First International Congress on Behaviorism and the Sciences of Behavior, Guadilajara, Mexico, 1992.

Self-Reports of Matching-to-Sample Success: Bias, Sensitivity, and Base Rates of Target-Response Reinforcement

Thomas S. Critchfield
Auburn University

Humans' self-reports were studied in three experiments using a delayed matching-to-sample (DMTS) task to generate target (i.e., referent) responses, and a query about whether the last DMTS response met a conjunctive speed-accuracy contingency of point reinforcement to generate Yes-No, button-press self-reports. In previous studies using similar procedures the accuracy, sensitivity (A′) and bias (B′H) of self-reports changed systematically with the manipulation of (a) the number of nonmatching DMTS sample stimuli on each trial, or (b) the stringency of the time limit on DMTS responses. It is possible that the critical feature of past manipulations was the base rate of overall target-response success (% reinforced DMTS responses) they produced. Described this way, previous studies have examined self-reports under only a limited range of target-response success rates (usually 50% or higher). The present studies engineered wider ranges of DMTS success rates by manipulating, across conditions, the number of nonmatching sample and comparison DMTS stimuli that could be present on each trial. Following DMTS pretraining in each condition, self-reports occurred after each trial and produced intermittent point gains when accurate, and point penalties when inaccurate. The points counted as chances in a drawing for cash prizes. In Experiment 1, six undergraduates each worked in 8 to 10 conditions that produced DMTS reinforcement on about 25 to 91% of trials. Report sensitivity was weakly, negatively related to DMTS success. A consistent bias for reporting DMTS success became less pronounced as DMTS reinforcement became less frequent; only extremely low DMTS reinforcement frequencies occasionally produced biases for reporting failure. Logarithmic lines of best fit accounted for 52 to 94% of the variance in bias functions (median = 76%). Experiments 2 and 3 showed that similar functions were obtained regardless of the presence or absence of the point consequences contingent on the self-reports. Overall, the concavity of the bias functions suggested a pervasive tendency to over-report target-response success that extends beyond the simple matching of "I succeeded" self-reports to base rates of target-response success.

Association for Behavior Analysis, May, 1992.

Punishment and the Emission of Self-Reports About Matching to Sample: Interaction with Trial Difficulty

Thomas S. Critchfield and David Cush
Auburn University

Two undergraduates performed a delayed matching-to-sample task in which correct responses faster than an 800-ms time limit earned points worth chances in a drawing for money. On different trials within a session, the matching comparison stimulus was drawn from either one or three sample-stimulus elements. After each response, a computer-generated query asked about whether the response met the point contingency. Subjects then pressed buttons labeled "Yes," "No," or "Don't Know." Accurate "Yes" or "No" reports earned points on an intermittent schedule. "Don't Know" responses had no consequence other than advancing the trial. Initially, "Don't Know" self-reports occurred infrequently, but when point loss was contingent on other self-reports (RR 2.5, independent of the "content" of the report), rates of "Don't Know" reports increased. The effect was more pronounced for three-sample trials than for one-sample trials. Neither the bias nor the sensitivity of self-reports changed systematically when punishment was introduced. The results show that punishment may interact in interesting ways with simple self-reports. Moreover, the failure of increased "Don't Know" rates to affect bias or sensitivity suggests that findings of previous studies using forced-report procedures may have some generality to procedures more closely approximating free-operant situations.

Southeast Association for Behavior Analysis, October, 1992.

Self-Reports of Matching-to-Sample Success: Further Characterization of a Bias for Reporting Reinforceable Responses

Thomas S. Critchfield, Scott Lane, and Joan Pargeon
Auburn University

Previous laboratory studies of humans' self-reports using similar procedures have described a tendency for subjects to over-report their success on the target task. Borrowing terminology from signal detection analysis, this tendency manifests as a bias (B'H; Grier, 1971) for reporting successful responses (i.e., inaccurate self-reports tend to occur as reports of success following unsuccessful responses). To date, the bias appears to be consistent across subjects and resistant to change. Study 1 re-analyzed data from previous reports and found that the bias manifests regardless of whether the DMTS difficulty is manipulated via stimulus complexity or stringency of the time limits. Study 2 examined the acquisition of self-reporting patterns, both with and without extensive DMTS pretraining, and found the bias to be generally present from the introduction of experimental tasks. Early appearance of the bias suggests that it is not an artifact of the DMTS pretraining procedures used in previous studies. Study 3 used probabilistically-generated reinforcer messages in a sham DMTS task and found that subjects over-reported reinforcement, even when it was response independent. In fact, correspondence between the proportions of successful responses and "I succeeded" self-reports improved in a subsequent condition using response-dependent DMTS consequences. Taken together, the studies suggest that a bias for reporting successful responses is pervasive and possibly extra-experimental in origin—an assumption with considerable precedent. For example, similar biases are observed across in numerous approaches to psychological measurement. Moreover, developmental research shows that parents (who presumably influence an individual's initial acquisition of self-observation and self-evaluation responses) tend to consistently overestimate their children's accomplishments and capabilities.

Association for Behavior Analysis, May, 1992.

Drugs and Performance-Self-Evaluation: Do Drugs Really Impair "Judgment"?

Thomas S. Critchfield and Michael Schlund
Auburn University

It is commonly assumed that, in addition to impairing performance, many recreational drugs also disrupt the user's judgment about (i.e., self-evaluation of) performance or performance capabilities. Such assumptions usually are supported with statistics

concerning the disproportionate number of automobile and industrial accidents involving persons under the influence of alcohol or other drugs. Unfortunately, this type of evidence is circumstantial at best, for three reasons. First, impairment of performance and impairment of self-evaluation are confounded in a single dependent measure (accident rates). Second, the analyses typically focus on group aggregates rather than the behavior of individuals. Third, the data are archival and thus do not reflect standard experimental controls. We believe that unambiguous description of performance self-evaluation, and any impairment thereof, requires direct measurement both of performance and of a separate response presumably under its discriminative control. We surveyed the literature for studies employing this approach to assess drug effects in human subjects. Given society's assumptions and concerns about drug effects on performance self-evaluation, surprisingly few studies have employed the necessary direct measures. Most of the studies we located used alcohol and other sedatives (usually benzodiazepines and barbiturates), with a smaller number investigating amphetamine. In most cases, the subjects were normal volunteers (nonabusers presumably free of psychopathology). Considering multiple conditions or experiments within individual reports, only about half the cases produced evidence that alcohol impairs self-evaluation of performance; about one third of the cases showed evidence that other sedatives have evaluation-impairing effects. There was virtually no evidence of effects for amphetamine. The interpretation of these reports was complicated by the fact that the large majority of studies lacked one or more important conventions of research design in pharmacology (double blind, placebo control, dose-response assessments, etc.). We conclude that, contrary to the common wisdom, there is little, if any, unambiguous evidence that drugs impair performance self-evaluation. An opportunity therefore exists for operantly-influenced, within-subject investigations employing pharmacologically sound experimental designs to address the issue of drug-induced changes in performance self-evaluation more precisely than has been accomplished to date.

Association for Behavior Analysis, May, 1992.

The Transfer of Respondent Eliciting and Avoidance Evoking Functions Through Stimulus Equivalence Classes

Michael J. Dougher, Eric Augustson, David E. Greenway, and Edelgard Wulfert
University of New Mexico
and
State University of New York at Albany

This study investigated the transfer of respondent eliciting and avoidance evoking functions through equivalence classes. In Experiment 1, 8 subjects acquired two, four-member equivalence classes through match to sample training. Using an on-baseline classical conditioning procedure, one member of one class was paired with shock while one member of the other class was presented without shock. All remaining stimuli were then presented. Response suppression and skin conductance served as measures of conditioning and function transfer. While there was little evidence for conditioned suppression, 6 of the 8 subjects showed the transfer of conditioned skin conductance. Experiment 2, used 8 subjects and similar stimulus equivalence and classical conditioning procedures. Then, while subjects engaged a key-press task, a differential, signalled avoidance task was introduced wherein shock was avoided if a response occurred to the stimulus previously associated with shock. The remaining stimuli from both classes were then presented. The behavior of all 8 subjects showed the differential transfer of the avoidance evoking function. The results have clear applied significance and extend the range of stimulus functions shown to transfer through equivalence classes.

Association of Behavior Analysis, May, 1992.

Rational Choice in Humans

Edmund Fantino
University of California, San Diego

Two sets of investigations with human subjects are reviewed. One set involves the question of whether subjects will match their choice responses to reinforcement outcomes under conditions in which it is non-optimal to do so. This study, inspired by Heyman

and Herrnstein's experiments with pigeons, assesses human choice in stimulus conditions designed either to encourage or discourage sensitivity to reinforcement outcomes. Our results are consistent with those with pigeons in that subjects rarely behaved optimally. The second set explores factors contributing to the "conjunction fallacy" in human decision making in which individuals report that the conjunction of two events is more rather than less likely to occur than one of the events alone. Our results suggest that subjects substantially respond to conjunctions by averaging the likelihood of their component parts. Finally, I outlined a series of studies to investigate the response of children and pigeons to multiple sources of stimulus control, such as those found in conjunctions.

Paper: Association for Behavior Analysis, May, 1992.

Does the Repeated-Reversals Procedure Establish Functional Classes?

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Repeated reversals of discriminations that are established with simple discrimination procedures have been said to establish functional classes (Vaughan, 1988; Sidman, Wynne, Maguire, & Barnes, 1989). It is possible, however, that the repeated-reversals procedure directly teaches relations among members of the seemingly emergent classes. For example, a subject who is presented with stimuli A1 and A2, or B1 and B2, or C1 and C2 — each of these pairs in a mixed sequence — may first be taught to select A1, B1, or C1, depending on the pair that is presented. These discriminations are then reversed, the subject learning to select A2, B2, or C2 when each pair is presented. Reversals and re-reversals continue until the reversal of one discrimination leads the subject to reverse the others also. For example, after a long history of reversals and re-reversals, suppose that the current procedure provides for selections of A1, B1, and C1 to be reinforced. The contingencies are once again reversed, with the next reinforcement coming after the subject selects A2. On subsequent trials, the subject selects B2 and C2, even though B1 and C1 have not (this time) gone unreinforced. When this happens, two functional classes — "contingency classes" — are said to have emerged. In the training procedure, however, trials with each discrimination (pair of stimuli) occurred more or less randomly. It is possible, therefore, that the correct choice in one trial (e.g., A1) might have served as a sample, as in a conditional discrimination, after which a choice of B1 or C1 in the next trial would be correlated with reinforcement. The seeming "simple" discriminations, therefore, might actually have been conditional discriminations, and each matching relation — A1-B1, B1-C1, A1-C1, B1-A1, C1-B1, etc. — might have been directly reinforced. In that case the reversals would not have been emergent, but rather, would have been directly taught. The present study investigated this possibility by restricting the sequence of presentation of the discriminations: Subjects were first given reversal training with A1 and A2, and B1 and B2, but not C1 and C2. They were then given reversal training with B1 and B2, and C1 and C2, but not A1 and A2. The A and C stimuli, therefore, could never have been directly related as samples and comparisons from one trial to another. The question was, "Would this separation of the A and C stimuli during reversal training prevent A1 and C1, or A2 and C2 from being classed together, even though they were each related to a common B stimulus?" Two subjects, a boy and a girl in their teens, each mentally retarded and with behavioral problems, failed to show the emergence of functional classes. One normal 15-year-old girl did. The two failures supported the suggestion that the discrimination reversal procedure may actually generate directly-taught conditional discriminations, and not functional classes. Experimenters will have to give explicit tests to determine whether seemingly generalized reversals can be attributed to the formation of equivalence or any other kind of emergent classes.

Poster: Association for Behavior Analysis, May, 1992.

Equivalence Class Formation Via Common Reinforcers: The Role of Naming

Celso Goyos
Universidade Federal de S. Carlos, Brazil

Four 4-5-year-old normal children were taught identity matching with four sets of stimuli, A, B, C, and D. Correct selections of A1, B1, C1, and D1 were fol-

A2, B2, C2, and D2 were followed by reinforcer R2 (a red token) (Dube, McIlvane, Maguire, Mackay, & Stoddard, 1989). Next, the subjects were similarly taught AB and BC arbitrary matching. Tests were then presented to assess the emergence of two A, B, C, and D classes. Three of the subjects passed all the tests; one subject, however, failed. During training and testing, all three subjects that passed also spontaneously named the stimuli with the names of the corresponding reinforcers, whereas no such naming was observed with the one subject who failed. For this subject, training to say the names in the presence of the stimuli showed immediate equivalence class formation. Two of the successful subjects were then introduced to reversed reinforcement contingencies on D-D identity matching trials; correct selections of D1 were followed by R2, and those of D2 by R1. In tests that followed, both subjects did not show the reversed equivalence classes (A1, B1, C1, D2 and A2, B2, C2, D1). Their matching responses remained consistent with the original equivalence classes and so did their naming. In the final phase, the two subjects were taught to reverse the D-stimulus *names* (labeling D1 as "red" and D2 as "yellow"). This verbal intervention led to the corresponding reversal in equivalence class membership. The overall results showed an orderly correlation between naming and the formation and subsequent re-formation of equivalence classes. Further research is necessary to verify if this correlation persists if naming is taught outside the baseline, and if the stimulus-reinforcer relations are established before tests are introduced.

Poster: Association for Behavior Analysis, May, 1991.

Humans' Choices in Situations of Time-Based Diminishing Returns

Eric A. Jacobs and Timothy D. Hackenberg
University of Florida

The choices of four adult humans were examined in situations of contrasting short-term and long-term consequences. The subjects were given repeated exposure to concurrent schedules of point delivery. Points were exchangeable for money. The schedules consisted of a fixed interval schedule and a progressive interval schedule, which began at 0 s and increaed by a fixed delay with each point delivered by that schedule. Under "Reset" conditions, choosing the fixed schedule reset the interval requirement of the progressive schedule to 0 s, in addition to delivering a point. These "Reset" conditions alternated with "No Reset" conditions, in which PI and FI choices were independent. The fixed interval schedule requirement and progressive schedule increment were varied independently across conditions. In all subjects, switching from the progressive to the fixed schedule was systematically related to fixed interval size and was consistently lower under the Reset than under the No Reset condition. The overall pattern of results was consistent with predictions of optimality theory for depleting situations.

Poster: Southeastern Association for Behavior Analysis, October, 1991.

Some Counterintuitive Aspects of Counters

Eric A. Jacobs and Timothy D. Hackenberg
University of Florida

The discrete operation of incrementing a counter is often assumed to serve a reinforcing function. However, when a counter is used it is impossible to dissociate the reinforcing properties of augmentation from the discriminative properties of the displayed score. Moreover, it is unclear whether a counter is even necessary to establish and maintain human performance. Three adult males were given repeated choices between a fixed interval (FI) 32 s and a progressive interval (PI) schedule. The schedule requirement of the PI began at 0 s, but increased in fixed increments (either 1 s, 4 s, or 8 s depending upon the condition) with each reinforcer delivered by the PI schedule. Selection of the FI, in addition to delivering a reinforcer, reset the PI schedule to its minimal value. Reinforcement consisted of presentation of a computer generated "beep" worth $.02. Conditions were run with and without a counter, which displayed cumulative points earned. Switching patterns did not depend on whether or not a counter was present, indicating that a counter is not a necessary feature of the experimental environment. Also, in all conditions switching from the PI to the FI occurred well prior to the point at which the schedules were equal, indicating sensitivity to consequences aggregated over several choices. If such sensitivity is verbally mediated, then one might expect the counter to enhance performance.

Poster: Association for Behavior Analysis, May, 1992.

Instructional vs. Schedule Control of Humans' Choices in Situations of Diminishing Returns

Veronica R. Joker and Timothy D. Hackenberg
University of Florida

Instruction-following was examined as a function of the correspondence between instructions and the contingencies specified by those instructions. By pressing keys on a computer keyboard, two adult humans chose between two schedules of point/ money delivery, a fixed time 60 s schedule and a progressive time schedule that began at 0 s and increased by a fixed increment, the size of which varied systematically across conditions. Each point delivered by the fixed time component reset the progressive time component to 0 s. Subjects were provided with instructions specifying a particular sequence of choices (e.g., "The best way to earn points is to select the blue square 5 times, then select the red square."). Initially, progressive time step size was 4 s. Under these conditions, the instruction was accurate (i.e., selecting the progressive time (blue) schedule 5 times before switching to the fixed time (red) schedule was the choice sequence yielding the highest reinforcement density. Thus, control by the instructions and control by the schedule requirements both supported the same performance. Then, the correspondence between this optimal choice sequence and the sequence implied by the instructions was gradually reduced. This was accomplished by first increasing, then decreasing progressive time step size gradually, typically in 1 s increments across conditions, while maintaining the same instructions. This permitted a systematic assessment of the limits of instructional control when instruction-following was placed into conflict with schedule demands. Choice patterns in both subjects were initially under instructional control. As the discrepancy between optimal and instructed patterns widened, however, instruction-following gave way to schedule sensitivity, as behavior came under control of the programmed consequences. Once established, schedule control persisted across conditions, even under circumstances that had previously occasioned instructional control.

Poster: Association for Behavior Analysis, May, 1992.

The Generalized Selection of Stimuli from their Description

Barry Lowenkron
California State University, Los Angeles

This presentation discusses the conditions of stimulus control under which humans become able to select novel objects from their description when these objects are composed of novel combinations of properties with known names (e.g., "Find the large green rectangle with two small dots below it."). Drawing on previously published experimental data, it is suggested that a conception of stimulus selection involving direct stimulus control over a selection response, such as pointing, is inadequate. It is a simple observation that in searching for a novel object from a description, a pointing response is not simply evoked by the object sought, but rather one recognizes the object as matching the description before selecting it. Given this observation, and given the conceptual limitations of the conditional discrimination in describing generalization, it is suggested that a more convincing case can be made if the selection response is described as autoclitic behavior under the control of the stimulus-control relation between two primary verbal operants. These operants, occurring before the actual selection response, are precurrent behavior. They function as a recognition process that precedes selection. Thus, if one must find an object that matches a given description, it is not implausible to assume that during the search, as each item is encountered, the description is repeated as an echoic. As a result, when the appropriate object is encountered, a second primary verbal relation appears: repetition of the initial description also serves to accurately tact the object. Repeating the description is thus now both an echoic (with respect to the prior repetitions), and a tact (with respect to the current object). This joint echoic-tact control then serves as the initiating condition for a nonvocal, descriptive autoclitic: the subject points to the object that is evoking the joint echoic-tact behavior—thereby selecting it. This provides a simple basis for generalization. If the descriptive autoclitic just tacts joint control, then any stimulus which evokes a verbal response under joint control can be selected. The final section of the address will illustrate how this interaction fulfills the role usually assigned by cognitive psychologists to a recognition process that precedes selection.

Association for Behavior Analysis, May, 1992.

Compound Stimuli in Emergent Stimulus Relations: Extending the Scope of Stimulus Equivalence

Michael R. Markham and Michael J. Dougher
University of New Mexico

Three experiments were conducted to investigate stimulus relations that might emerge when college students are taught to match unitary comparison stimuli to compound sample stimuli. In Experiment 1, subjects were taught 9 AB-C stimulus relations, then tested for the emergence of 18 associative AC-B and BC-A relations. All subjects showed the emergence of all tested relations. Twelve subjects participated in Experiment 2. Six subjects were taught 9 AB-C relations then tested for symmetrical (C-AB) relations. Six subjects were taught 9 AB-C and 3 C-D relations then tested for 9 AB-D (transitive) relations. Five out of 6 subjects demonstrated the emergence of symmetrical relations, and 6 subjects showed the emergence of transitivity. In Experiment 3, 5 college students were taught 9 AB-C and 3 C-D relations then tested for 9 equivalence (D-AB) relations, and 18 AD-B and BD-A relations. Three subjects demonstrated all tested relations. One subject demonstrated the AD-B and BD-A relations but not the D-AB relations. One subject did not respond systematically during testing. The results of these experiments demonstrate the emergence of stimulus relations other than reflexivity, symmetry, and transitivity, and extend stimulus equivalence research to more complex cases.

Association for Behavior Analysis, May, 1992.

An Analysis of Efficiency in Producing Stimulus Equivalence Using One or Two Correct Comparisons

G. L. McCuller, T. R. Plummer, and
B. Lignugaris-Kraft

This study compared the efficiency of two procedures for producing stimulus equivalence with individuals with mental retardation. A four-choice match-to-sample procedure was used in which participants were trained and tested to select the one comparison stimulus (Procedure 1) or two comparison stimuli (Procedure 2) arbitrarily selected to serve as correct choices. For each procedure, two separate sets of stimuli were used in training and testing. Efficiency was determined by the number of training and test sessions required for participants to respond correctly to 90% of the trials of untrained relations. Moreover, training was implemented and correct responding to symmetrical and transitive relations was monitored using an alternating treatment design (Barlow & Hayes, 1979). Results indicate that match-to-sample procedures using a two correct comparison format are more efficient than a one correct comparison format at teaching conditional relations to individuals with mental retardation. These results support the premise that formation of equivalence classes may be brought under contextual control (Hayes, 1991; Steele & Hayes, 1991). Moreover, that control may be established by the procedures used in an experiment and subjects' previous history of relational responding. In the present study, the subjects were taught concurrently that one set of stimuli should be responded to with one comparison and another set of stimuli should be responded to with two comparisons. Hence, subjects were taught that the two sets of stimuli should be responded to in different ways. This training procedure in combination with a prior history of relational responding may effect the emergence of new relations. That is the relational frame (Hayes, 1991) of "difference" may be such that stimuli that are responded to differently in training (i.e., reinforced trials) must also be relationally different in terms of emergent relations (i.e., nonreinforced novel trials) as was the case in this study.

Poster: Association for Behavior Analysis, CA, May, 1992.

An Interaction of Instructions and Training Design on Stimulus Class Formation

Richard R. Saunders, Kathryn J. Saunders, Dean C. Williams, and Joseph E. Spradlin
University of Kansas

Our previous research with subjects with mild retardation indicated different outcomes on stimulus equivalence tests when different training designs were employed. Some subjects were exposed to match-to-sample training involving four pairs of samples and one pair of comparisons (comparison as node) and others to four pairs of comparisons and one pair of samples (sample as node). Across published studies, equivalence tests were positive for 6 of 6 subjects taught with the comparison-as-node (CaN) procedure while the tests were positive for only 1 of 5 subjects taught the reverse. Results of five subsequent studies to test the reliability of and analyze these differences suggest that: a) pre-experimental individual differences and subject assignment may not account for the previous findings, b) the greater effectiveness of the CaN procedure may be due partially to an interaction of the procedure and instructions providing stimulus names, and c) these differences may be demonstrated only with developmentally limited subjects. Several theoretical interpretations of why the CaN training method is more likely to produce positive equivalence test performances include: a) the similarity of the CaN procedure to the typical establishing procedures for creating functional classes, b) the CaN procedure insures more nearly complete discrimination between the stimuli in one potential class and the stimuli in the other, c) indirect reflexivity (Hayes, 1992) and conditioned perception (Lawrence, Mitchum & Shull, 1991) accounts of equivalence are supported more directly by a CaN paradigm than other training paradigms.

Paper: 15th Symposium on the Quantitative Analysis of Behavior, June, 1992.

Cross-Species Comparison of Choice in Self-Control Paradigms Using Fixed and Adjusting Delays

Henry Tobin, John J. Chelonis, L. B. Forzano, and A. W. Logue
State University of New York at Stony Brook

Self-control in the laboratory is defined as the choice of larger, more delayed reinforcers. The present research investigated whether the relative degree of self-control shown by a particular species is similar across different reinforcement schedules. Analyses used data from four subject/reinforcer combinations. For both fixed- and adjusting-delay procedures, pigeons responding for food showed the least self-control, then rats responding for food, then humans responding for food, and the most self-control was shown by humans responding for points exchangeable for money.

Paper: Eastern Psychological Association, April, 1991.

Endogenous Stimulation and the Analysis of Response Form as Matching Behavior

Henry Tobin and A. W. Logue
State University of New York at Stony Brook

This research explored the potential usefulness of the Matching Law for quantifying effects of *endogenous stimuli* on choice of response form. Endogenous stimuli refers to physical stimuli resulting from the subject's functioning during the production of a behavior. Twenty-four undergraduates (20 female, 4 male) placed pegs in a pegboard first using only one hand, then using only the other hand, and then using either hand. Subject handedness was assessed (1) by taking the relative frequency of use of each hand and (2) by using the Modified Annett's Handedness Inventory. The results indicated that the pegboard task provides an appropriate measure of handedness. Performance on this task appears to be affected by learning. In addition, the *net endogenous stimulation* involved in performance of this task appears to act by means of aversive consequences because, across subjects, the relative frequency with which one hand was chosen for use decreased as the relative duration of effort spent in using that hand increased. Whether trials were discrete or free operant, and whether subjects were or were not required to place pegs in a fixed pattern, did not appear to affect relative hand use. Together, these results suggest that the Matching Law could possibly be applied in the analysis of the effects of endogenous stimuli on response form.

Poster: Association for Behavior Analysis, May, 1991.

Third-Order Equivalence Classes

Edelgard Wulfert
State University of New York at Albany

David E. Greenway and Michael J. Dougher
University of New Mexico, Albuquerque

Two experiments were conducted to examine the emergence of third-order equivalence classes. In Experiment 1, college students were trained in three successive phases to perform first-, second-, and third-order baseline conditional discriminations. In each phase, after attaining the baseline criterion, equivalence tests were conducted. Passing a test in a given phase was required for advancing to the next phase. Five of 10 subjects showed performances consistent with third-order equivalence classes. To analyze why higher-order relations sometimes did not emerge, the study was replicated in Experiment 2 with four different subjects who were instructed to talk aloud during all training and test phases. Two subjects completed the experiment and showed third-order equivalence; the other two were unable to advance beyond Phase 2 because they failed to complete the second-order symmetry test. A protocol analysis (Ericsson & Simon, 1980; Wulfert, Dougher, & Greenway, 1991) was performed on their verbal responses to identify possible sources of control. The verbal protocols revealed that the subjects' behavior was not under the control of the intended second-order conditional stimuli. When control by these stimuli was established through instructions, second-order, and in Phase 3 third-order, equivalence relations emerged. This research replicates previous studies on second-order equivalence and extends contextual control over emergent relations to the third order. The implications of complex emergent relations for a behavioral analysis of cognitive-verbal phenomena such as concept formation and classification are discussed.

Association for Behavior Analysis, May, 1992.

GRANTS AWARDED TO EAHB SIG MEMBERS

Grant Title: Social Transitions and Employment Project
Principal Investigator: Linda J. Hayes, University of Nevada
Agency: Department of Education
Dates: 07-01-92 to 06-30-93
Amount: $36,100

The grant was awarded to fund a pilot project aimed at enhancing competitive employment opportunities for developmentally disabled persons. The funds are used to supplement existing resources for behavioral assessments related to employment potential and interests; job skills and job readiness training; job acquisition; and on-the-job training and support. Graduate and undergraduate students in the Behavior Analysis Program at the University of Nevada serve as project managers and trainers, respectively. The involvement of students who are training in behavior analysis insures a better-trained staff than would otherwise be available given funding levels, and produces a cadre of trained professionals and paraprofessionals for future work in this area.

Title: Children's Recognition of Objects from their Description
Principal Investigator: Barry Lowenkron, California State University
Agency: National Institute of Child Health and Human Development
Dates: 10-01-92 to 09-30-95
Amount: $101,000

The long-term objective of this research is to expand on prior work by the author in developing a behavioral account of intellectual development. In this account theoretical explanations of complex behavior, based on inferred events, are replaced by empirical descriptions of behavior constructed from overt, directly-trained components with known properties. The immediate objective of the current work is to examine the process by which children recognize objects as matching a given description. In the first experiment, explicitly trained components are used to construct a matching-to-sample performance in which children first recognize and select complex stimuli from a verbal description supplied by the experimenter, and then generalize the performance to novel descriptions of novel stimuli. Next, a series of experiments will analyze the critical elements in this performance. Finally, two experiments will study the conditions under which additional responses may be added to the relatively passive recognition performance so as to produce an active goal-oriented behavior in which children construct stimuli to meet the descriptions.

From a conceptual viewpoint, the research has one other aim: and that is to study the role of joint control. Prior research has shown that joint stimulus control allows for the production of behavior based on far more abstract relations than behavior trained under normal discriminative stimulus (S^D) control. The current research will study the feasibility of describing the actual process of object recognition (as distinct from object selection) in terms of joint stimulus control. The longer term aim here is to examine the usefulness of this notion as a supplement to the concept of the S^D.

Title: Effects of Punishment on the Frequency and Structure of Multi-Response Verbal Self-Reports
Principal Investigator: T. S. Critchfield, Auburn University
Agency: Cambridge Center for Behavior Studies
Dates: 1 year
Amount: $5,280

This research will employ a multi-response operant as the unit of analysis in studies of automated verbal self-reports, with a particular emphasis on the effects of punishment contingencies on the composition of the verbal response. A few previous laboratory studies have profitably examined discrete self-reports as operant behavior, although the range of questions asked, and phenomena explored, has been some what limited. Due in part to an emphasis on discrete response units, existing studies have focused on global dependent measures such as absolute or relative frequency of emission, or correspondence of the self-report with nonverbal events (e.g., "accuracy"). Largely ignored to date have been phenomena occurring *within the structure of individual verbal reports* (e.g., composition effects, self-editing, etc., as described by Skinner, 1957). Four experiments will begin the process of developing methods suitable to the analysis of such effects while maintaining a traditional operant emphasis on experimental rigor.

Title: Aging and On-Line Self-Monitoring of Nonverbal Performance
Principal Investigator: T. S. Critchfield
Agency: Auburn University Competitive Research Grant-in-Aid Program
Dates: 1 year
Amount: $3,749

This research will employ verbal self-reports to compare the discrimination of performance success in younger (ages 18 to 35) and older (ages 62+) adults. Elderly individuals, even when physically and mentally healthy, tend to exhibit declines in several abilities, which may include the moment-to-moment (or "on-line") self-monitoring of performance—a capability believed to be integral to a variety of every day performances in which responses must be regularly titrated against changing environmental demands (e.g., operating an automobile). In two experiments, older and younger adults will make self-reports about their performance in delayed identity and oddity matching to sample. Age is a between subjects factor and time pressure and stimulus complexity will be manipulated within subject.

SUBMIT ABSTRACTS, ARTICLES, AND GRANTS RECEIVED FOR THE NEXT ISSUE

To keep current with member activities we would like to publish abstracts from conference presentations, articles published or in press, and grants received in every issue. It is not too early to send abstracts from ABA 1993 and other Spring conferences. Abstracts should be no more than 200 words; those longer than 250 words will be returned to you for editing. Send to Kate Saunders by May 4.

RECENT PUBLICATIONS OF EAHB SIG MEMBERS

Bickel, W. K., DeGrandpre, R. J., Higgins, S. T., & Hughes, J. R. (1990). Behavioral economics of drug self-administration I. Functional equivalence of response requirement and reinforcer magnitude. *Life Sciences*, **47**, 1501-1510.

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Logue, A. W., & King, G. R. (1991). Self-control and impulsiveness in adult humans: Individual differences when food is the reinforcer. *Appetite*, **17**, 105-120.

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Palmer, D. C., & Donahoe, J. W. (in press). Essentialism and selectionism in cognitive science and behavior analysis. *American Psychologist.*

Troisi, J. T., Critchfield, T. S., & Griffiths, R. R. (in press). Buspirone and lorazepam abuse liability in humans: Behavioral and subjective effects and choice. *Behavioural Pharmacology.*

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CALL FOR STUDENT PAPERS

10TH ANNUAL STUDENT PAPER COMPETITION

The Experimental Analysis of Human Behavior

The ABA Special Interest Group for the Experimental Analysis of Human Behavior (EAHB-SIG) seeks submissions for its 1993-94 Student Paper Competition, which is designed to recognize and promote scholarly activity in the experimental analysis of human behavior.

Who is eligible to submit? All current students, and individuals who received degrees less than one year before the submission deadline. Undergraduate papers will receive special consideration in the review process as long as they were authored during bachelor's training.

What sort of paper is appropriate for the contest? Any paper (e.g., conceptual, review, empirical) that addresses issues relevant to the experimental analysis of human behavior.

How are winners selected? Awards are based on blind review by established members of the EAHB-SIG and selected outside experts. All papers receiving favorable reviews will be recognized.

What are the benefits of participating? The primary benefit of the competition is exposure to the peer review process. All student authors receive journal-caliber reviews, primarily from individuals who serve on editorial boards of the major behavioral journals. Winners receive a commemorative plaque, an invitation (including convention registration fees) to present a summary of their work in a special symposium at the 1994 ABA Convention in Atlanta. Space permitting, a version or summary of each winning paper will appear in the EAHB Bulletin . Past winners also have received wider recognition within ABA.

CONTEST RULES

- The student must be first and primary author. Advisors may provide conceptual and technical assistance, however, most co-authored manuscripts will contain too much input from the advisor to qualify as a student paper. Contact the competition coordinator well in advance of the submission deadline if you have questions regarding authorship.

- The submission must be accompanied by a letter from the faculty advisor describing the relative contributions of the student and advisor.

- Recent graduates (< 1 yr. post-degree) may submit only work authored during their training. For consideration as an undergraduate work the paper must have been written during bachelor's training and must not have been substantially revised since that time.

- The paper should be prepared as if for submission to a journal, and must meet APA publication guidelines. There is no maximum length but focused, parsimonious manuscripts are likely to be evaluated most favorably.

- To facilitate blind review, the title page should not contain any author identifying information. Instead, attach a cover letter stating the title of the manuscript and listing the student author's address and telephone number (both home and work/school).

Submissions must be received by Sept. 20, 1993.

Papers not meeting specifications may be returned without review.

Send 4 copies of the paper to:
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